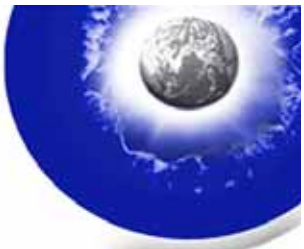
MAIN CONCEPT The Codec People®
A DIVX® COMPANY



MainConcept™ Reference MVC Beta

Professional Transcoding Application

Version 2.1 Beta

www.mainconcept.com

MainConcept Reference v2.2 - MVC Encoder Beta 2

Table of Contents

Introduction

MVC - The new standard for Blu-ray 3D 3

Getting Started

System Requirements 5
Installation 6
Installing the MainConcept Reference Application 6
Unlocking MainConcept Reference MVC Beta 11

The Reference MVC Beta Usage

Creating MVC/Blu-ray 3D compliant streams 14

The Advanced MVC Encoder Interfaces

The Basic Settings Pane 16
The Advanced Settings Pane 20
The Layers Pane 24

Technical Support

MainConcept Support 27
Additional Information 27

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Edition: December 15, 2010

Introduction

MVC - The new standard for Blu-ray 3D

MVC (*Multiview Video Coding*) is a new amendment to the H.264/AVC standard that allows you to generate stereoscopic and multi-view 3D video streams. It is also an essential part of *Free Viewpoint Video* (FVV), the interactive selection of viewpoints as well as direction within an operating range (a virtual view, not an available camera view). MVC makes use of some interfaces and approaches that have been initiated with the *Scalable Video Coding* (SVC) extension of H.264/AVC standard.

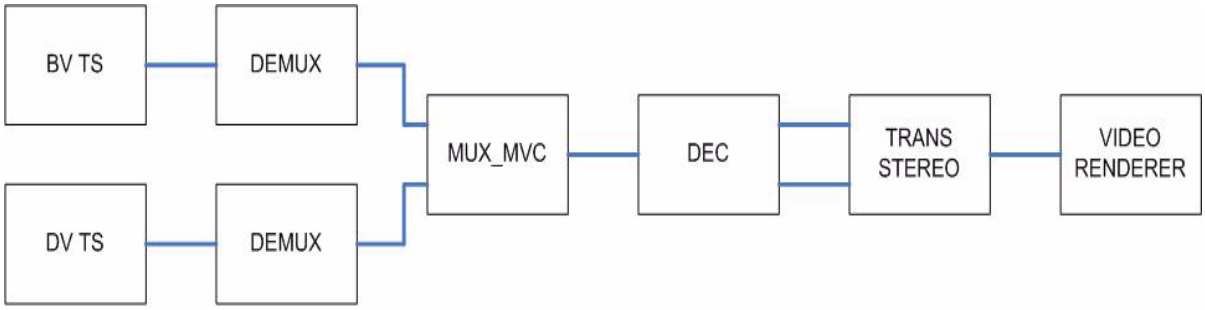
After the *Blu-ray Disc Association* (BDA) approved and released the new “Blu-ray 3D” specification, multiview video coding has generated a lot of interest in the content and content delivery markets. Right now more and more movies are produced in 3D for enhanced entertainment. There is also a steadily increasing number of cinemas that are able to present movies in 3D. In the near future, users will also want to watch these 3D films in their living-room or on a PC. Many companies have recently announced plans to release TVs, monitors and Blu-ray players with 3D playback capabilities. Now it is up to the content community to deliver larger amounts of compelling 3D content to satisfy the needs of the home entertainment market.

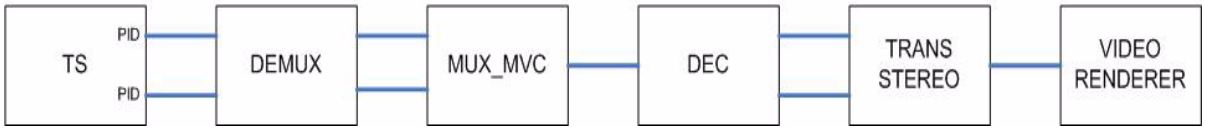
The Reference MVC Beta transcoder includes presets to generate Blu-ray 3D compliant streams that can be played back by any Blu-ray Player and TV supporting 3D content playback. The MainConcept Blu-ray 3D / MVC Encoder is based on the current H.264/AVC Encoder implementation, and includes all its features. Up to 10 layers are supported, i.e. the different views are encoded as different layers to provide a 3D depth impression of the current picture. In this standard, the encoder receives N temporally synchronized video streams and generates one bitstream out of them, i.e. two separate views are coded together. For 3D encoding, it generates one layer for the left and one for right eye.

The Reference MVC Beta supports the High Profile as prescribed by the MVC specification. The bit rate of MVC encoded streams is proportional to the number of views, but it is still more efficient than similar approaches.

Reference MVC Beta is a standalone transcoder, but can be unlocked in the familiar way. It does only support MVC and Blu-ray 3D encoding, resp. All other codecs you know from the regular Reference 2 application are not included. However, you can install the current Reference 2.1 version on the same system, and work with it and its other codecs in parallel.

The Reference MVC Beta 2 now also supports decoding, because it comes with all necessary DirectShow filters to play back the streams in GraphEdit.





Getting Started

System Requirements

MVC/Blu-ray 3D encoding is very resource-intensive. To achieve acceptable speeds, we recommend at least these minimum specifications:

Operating system:

Microsoft® Windows® 2000, XP, Vista, Windows 7 (we recommend to install always the current Service Pack for the used operating system), Microsoft® DirectX 9.0®.

MainConcept Reference MVC Beta is a standalone application, i.e. Reference 2.1 does not need to be installed. Both versions can work simultaneously on your system.

Processor:

1 GHz or faster

RAM:

256 MBs (1 GB recommended)

Hard drive speed:

7200 RPM

MainConcept Reference MVC Beta will work on many systems not meeting these specifications, although rendering speed will be slower. So it also depends on the actual codec plug-in you use, whether you system requirements are achieving acceptable results and speed or not.

Installation

In the following chapter we will introduce the installation of MainConcept Reference MVC Beta as well as how to turn it into a full version after you have purchased a valid license for it.

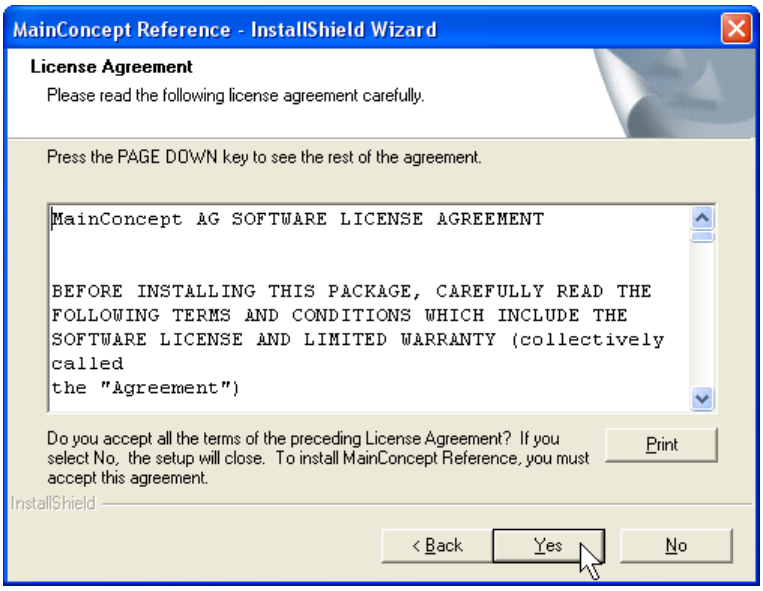
Installing the MainConcept Reference MVC Beta

If you downloaded the Reference MVC Beta application, please follow the steps below:

1 Double-click the **Setup** file. A splash screen and progress indicator will appear.

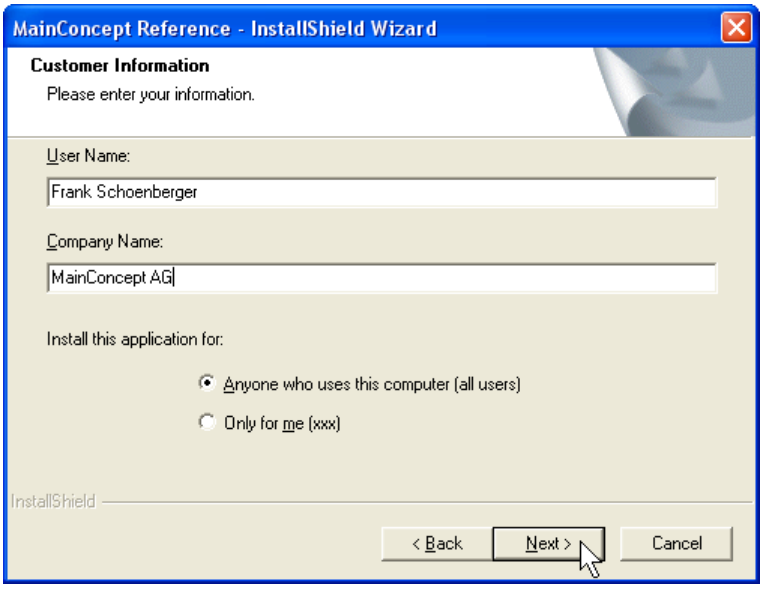
It may take a few moments until the installation process begins. In the **Welcome** dialog, click **Next** to proceed.

2 When the license agreement appears on the screen, review it carefully, then click **Yes** if you agree to the terms and you want to continue the installation.

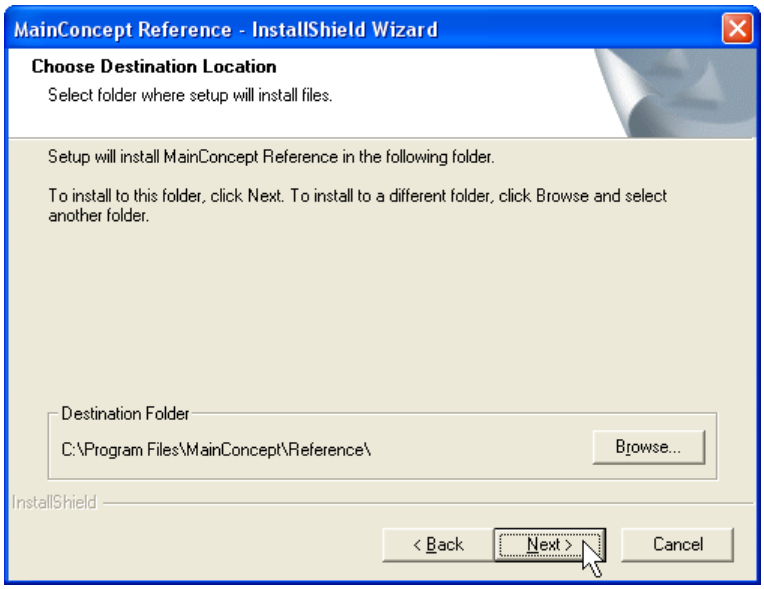

MainConcept Reference - InstallShield Wizard
License Agreement
Please read the following license agreement carefully.
Press the PAGE DOWN key to see the rest of the agreement.
MainConcept AG SOFTWARE LICENSE AGREEMENT
BEFORE INSTALLING THIS PACKAGE, CAREFULLY READ THE FOLLOWING TERMS AND CONDITIONS WHICH INCLUDE THE SOFTWARE LICENSE AND LIMITED WARRANTY (collectively called
the "Agreement")
Do you accept all the terms of the preceding License Agreement? If you select No, the setup will close. To install MainConcept Reference, you must accept this agreement.
Print
InstallShield
< Back
Yes
No

If you do not click **Yes**, the installation process will be aborted.

3 In the following dialog you have to provide some **Customer Information**, i.e. you are asked to enter your name and company name. Depending on your system configuration, you might also need to choose whether to install MainConcept Reference MVC Beta for all users or only yourself. Then click **Next**.



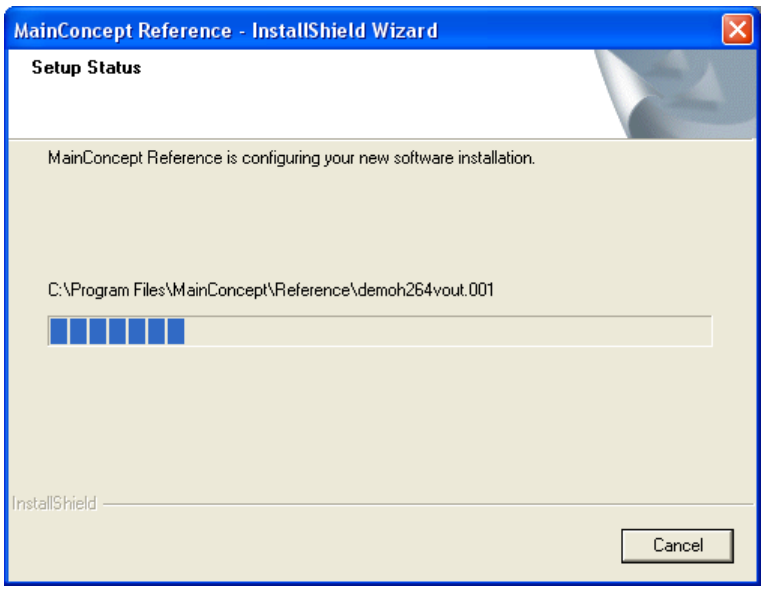
4 In the following dialog box, you can choose the location where the software files will be stored on your computer.


MainConcept Reference - InstallShield Wizard
Choose Destination Location
Select folder where setup will install files.
Setup will install MainConcept Reference in the following folder.
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.
Destination Folder
C:\Program Files\MainConcept\Reference\
Browse...
InstallShield
< Back
Next >
Cancel

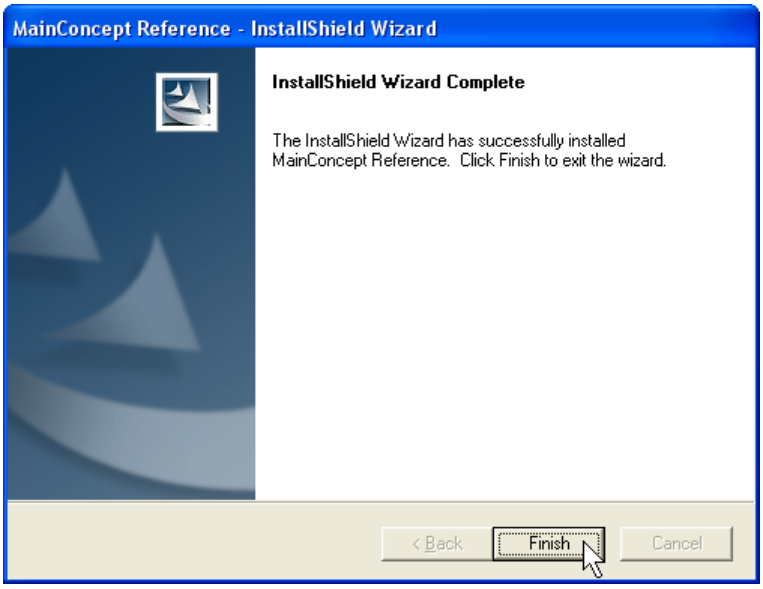
You can accept the default settings or click the **Browse...** button and select a different destination directory. Click **Next** to proceed.

You can accept the default settings, enter a new folder name or select any existing folder. Then click **Next**.

5 Now the installation starts. An indicator will show the installation process.

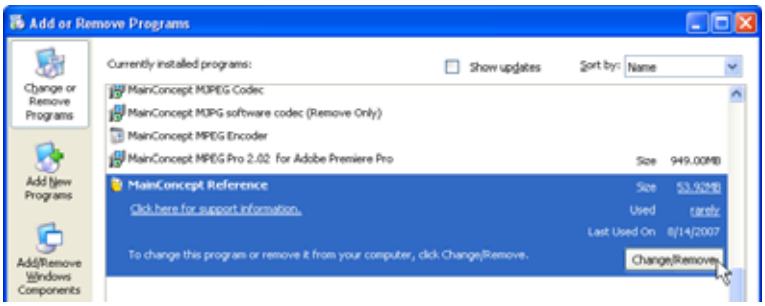


6 When the following dialog box appears, click **Finish** to complete the setup.


MainConcept Reference - InstallShield Wizard
InstallShield Wizard Complete
The InstallShield Wizard has successfully installed MainConcept Reference. Click Finish to exit the wizard.
< Back
Finish
Cancel

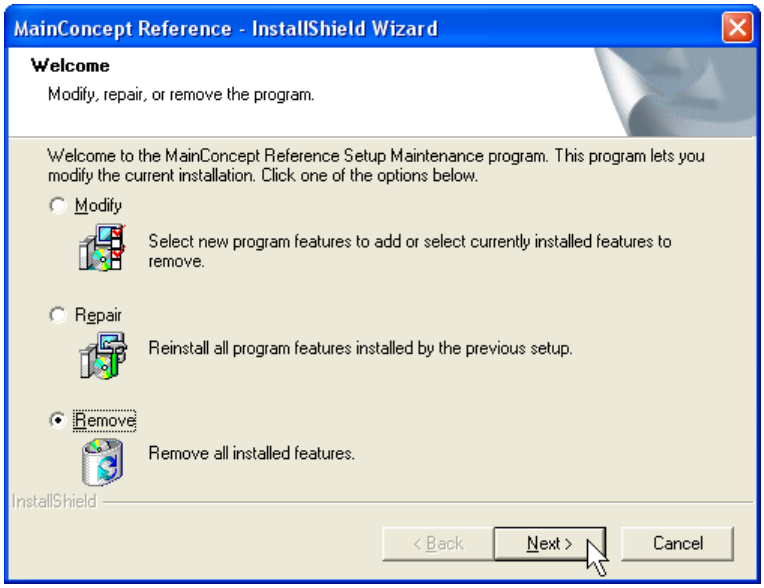
The MainConcept Reference MVC Beta application with Blu-ray 3D presets as demo versions is now installed on your computer. You can launch it from your Windows start menu or from the shortcut on your Windows desktop.

If you ever need to uninstall the program, you can launch the uninstaller from the **Add or Remove Programs** option in the Windows **Control Panel**.



Or, you can launch the uninstaller by running the **Setup** program again.

Enable the **Remove** option and click **Next** to uninstall the MainConcept Reference MVC Beta from your system. Then follow the on-screen prompts.


MainConcept Reference - InstallShield Wizard
Welcome
Modify, repair, or remove the program.
Welcome to the MainConcept Reference Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.
Modify
Select new program features to add or select currently installed features to remove.
Repair
Reinstall all program features installed by the previous setup.
Remove
Remove all installed features.
InstallShield
< Back
Next >
Cancel

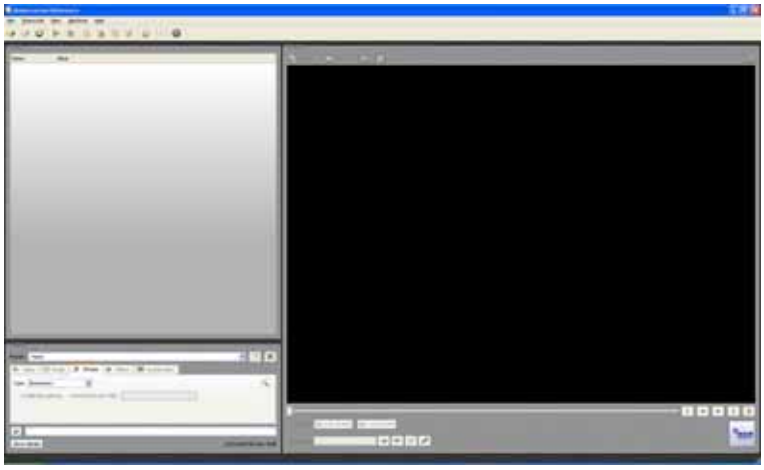
You will need to confirm that you want to remove MainConcept Reference MVC Beta. Click **OK** to start the uninstall process.

You will be notified when uninstallation is complete. Click **Finish**.

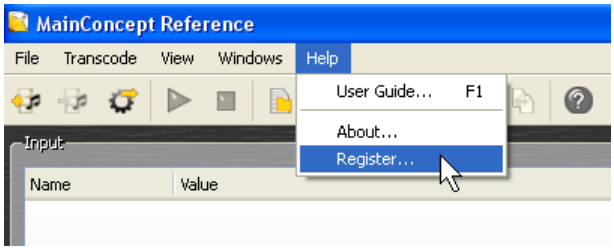
Unlocking MainConcept Reference MVC Beta

After you have purchased the Refernece MVC Beta full version, you will receive a serial number for it. To unlock it, please repeat the following steps, in order to get rid of the watermark in the encoded file.

1. Start MainConcept Reference MVC from the Windows **Start** menu or by double-clicking the program icon from your desktop. Wait until the main interface of MainConcept Reference appears on the screen.

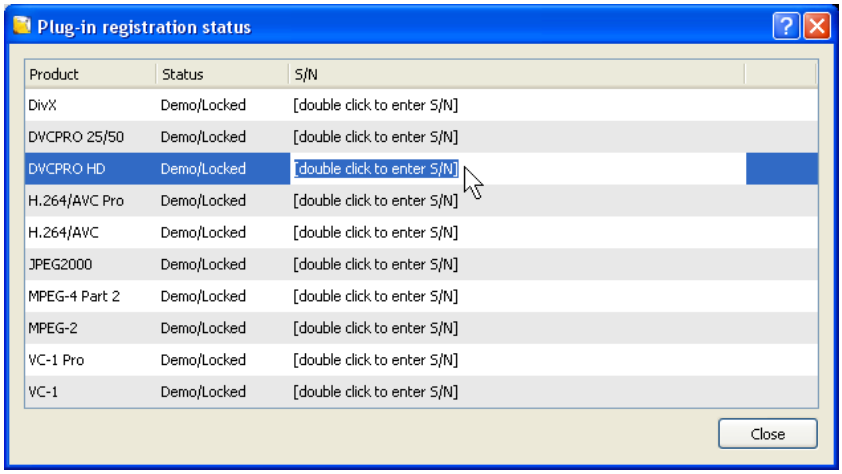


2 Then go to the **Help** option in the menu bar, and choose the **Register...** option.



The **Plug-In registration status** dialog will appear on the screen then.

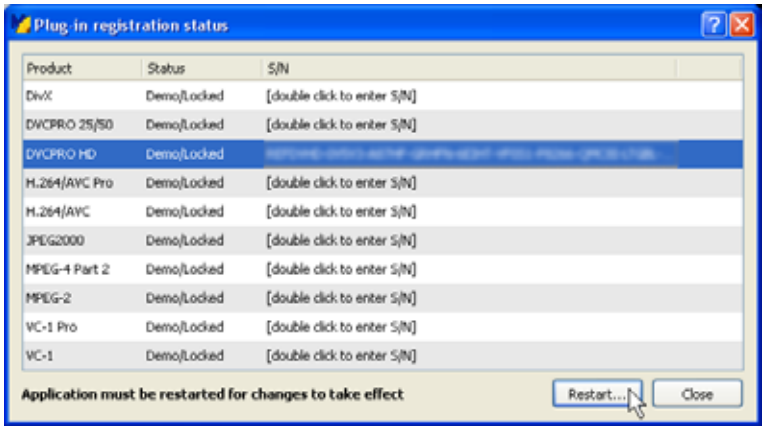
3 The **Plug-In registration status** dialog gives an overview about the status (demo/full) of the installed MainConcept Reference codec plug-ins. To unlock the application, double-click the corresponding item in the list. Under **MVC**, double-click the **[double-click the to enter S/N]** field in the **S/N** column. To unlock the beta version, you will need to enter your personal serial number. Confirm by clicking **Return**.



When the registration key is correct, you will receive a message that you successfully unlocked Reference MVC Beta.

If you enter a wrong serial number an error message appears and you are asked to enter the serial number again.

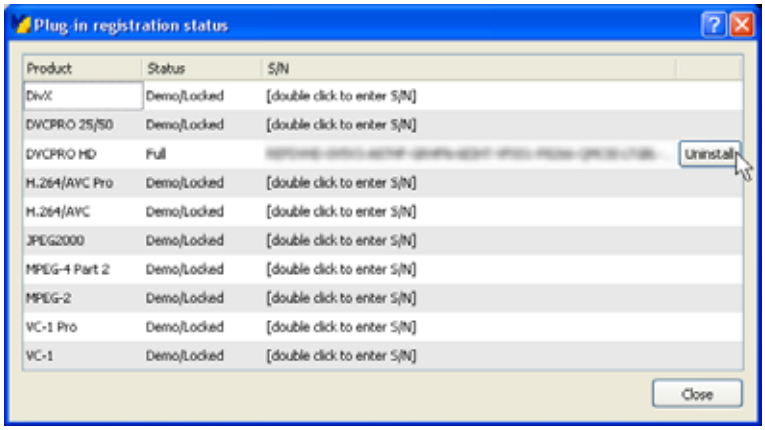
4 After successfully unlocking Reference MVC Beta, you have to restart the application. Click the **Restart...** button to launch MainConcept Reference MVC Beta again.



Click the **Close** button to restart the application later. Then the key will take effect until the next start of MainConcept Reference MVC Beta.

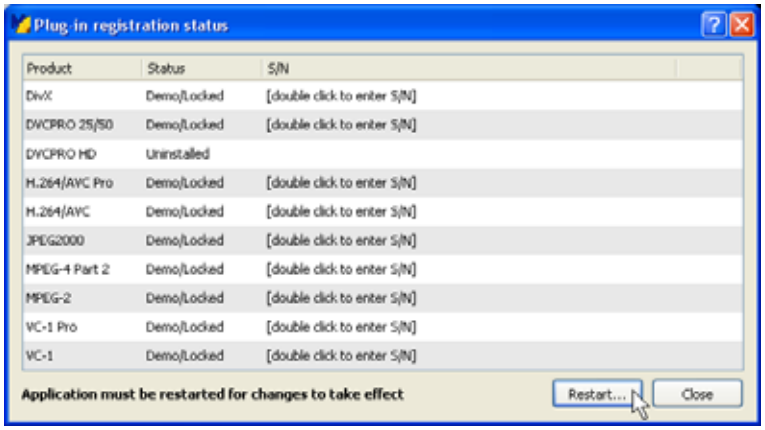
5 In order to finish the unlocking procedure, you have to run MainConcept Reference MVC Beta from the Windows **Start** menu or by double-clicking the program icon from your desktop. Now the codec you have registered before have no restrictions any more.

If you ever need to remove the key for MainConcept MVC, you can open the **Register...** dialog again. Select the codec you want to unregister and click the **Uninstall...** button.



You have to confirm if you really want to unregister the selected codec.

You have to restart the application, so that the changes will take effect. Click the **Restart...** button to launch MainConcept Reference MVC again.



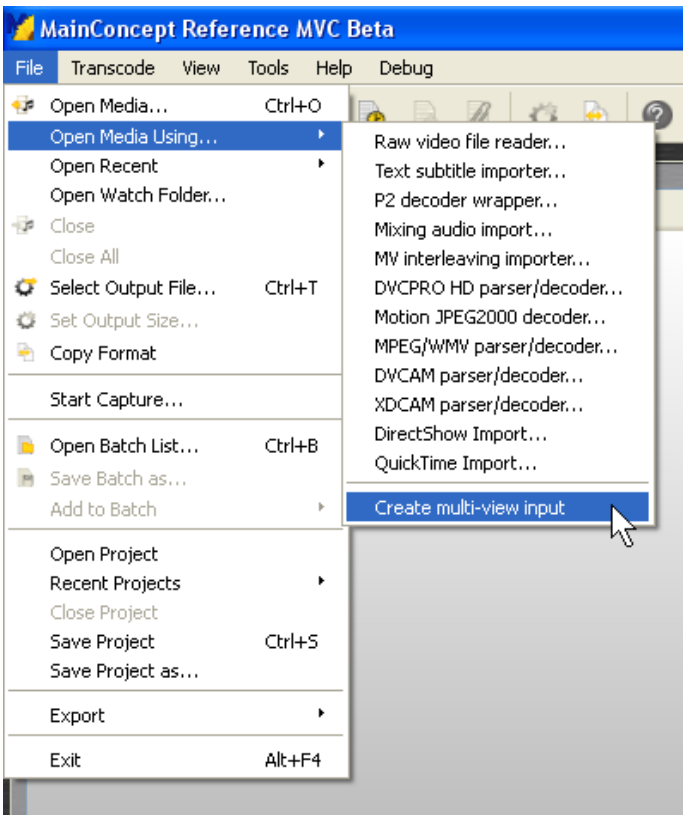
Now the corresponding codecs will be unregistered after restarting the application.

The Reference MVC Beta Usage

Creating MVC/Blu-ray 3D compliant streams

In general, the MainConcept Reference MVC Beta version works in the same way as the official Reference 2.1 release version, but it only supports the MVC/Blu-ray 3D profile. However, we forbear of explaining all options, settings and parameters from the regular Reference 2.1 application, but only focus on the MVC specific ones. We recommend referring to the Reference 2.1 documentation for the general features and the interface description.

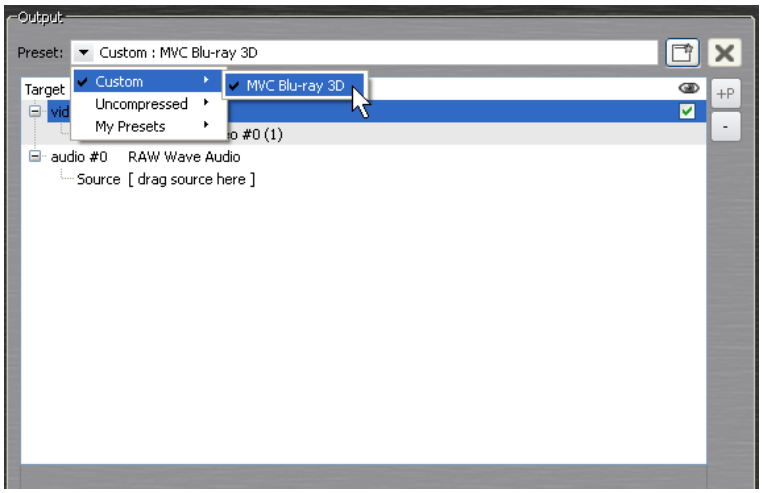
The import of source streams for Blu-ray 3D transcoding works differently in the Reference MVC Beta version. Due to the fact that the software requires two input streams, e.g. one stream for each view for Blu-ray 3D (base and dependent), you have to go to **File > Open Media Using... > Create multi-view Input**. In the following window, you can select the corresponding streams.



During file import, Reference MVC Beta creates a metafile (*.mmf) with the information about the first and second view, and you can use it as regular input file afterwards.

Please note that the selected input files must have the same dimensions, frame rate as well as duration.

Now drag the imported MMF file from the **Input** into the **Output** section. Currently, Reference MVC Beta only supports one preset and profile, resp. Under **Preset** choose **Custom > MVC Blu-ray 3D**.



The **MVC Blu-ray 3D** preset offers two resolutions only: 128x720 and 1920x1080. They can be accessed by changing the **Mode** (**PAL** or **NTSC**). **PAL** only allows 1280x720, but **NTSC** also allows 1920x1080.

Of course, you have the opportunity to finetune the settings. When you choose a preset here, all other settings are automatically adapted. Due to the specifications of these presets, some options are not available or are disabled.

The button with the wrench opens the advanced MVC Encoder dialog, that offers numerous additional settings. Here you can adjust the parameters for the specific MVC layers of your stream. These options are predominantly for professional users, because you need a detailed and competent knowledge for them. Some changes might result in incompatible files. But we will explain these settings later on.

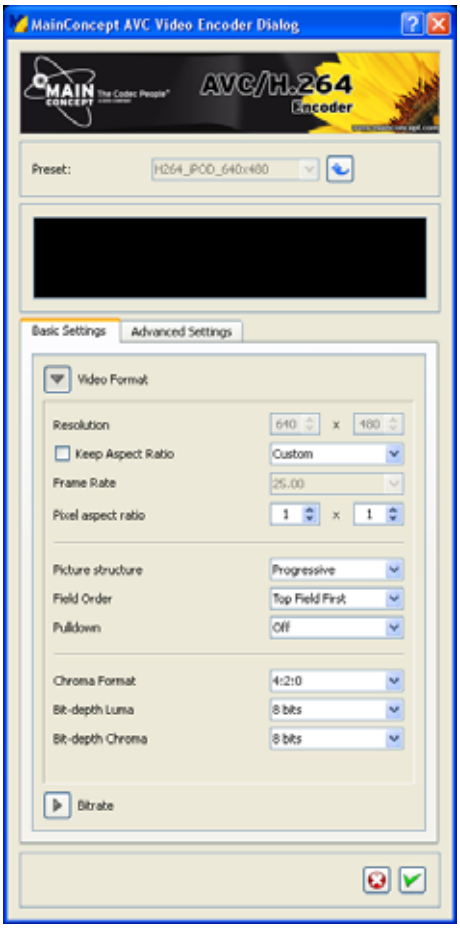
The Advanced MVC Encoder Interfaces

The advanced windows for MainConcept Reference MVC are similar to MainConcept H.264/AVC, but offer an additional pane: **Basic Settings**, **Advanced Settings**, and **Views**. Some options are only available when certain parameters are in effect.

The Basic Settings pane

In this dialog you specify different basic video settings for **Video Format**, and **Bitrate**.

The drop-down menu **Video Preset** shows the current encoding preset for H.264/AVC. There are a few differences between the options we like to explain to you briefly. Using **H.264 Baseline** the encoder does not use B-slices. For the Baseline profile only progressive and for coding mode only CAVLC are available. The **H.264 Main** profile enables you to use B-slices and CABAC as coding mode, too. You can choose interlaced or progressive here. In general, this profile offers better encoding properties.



Under **Video Format** you find the following options:

The spin boxes under **Resolution** are disabled here, because you can specify the desired resolution in a previous dialog.

The checkbox **Keep Aspect Ratio** you can only change in the previous dialog, too. For that reason, it is disabled here. The drop-down menu next to it enables you to change the aspect ratio of the clip.

The **Frame Rate** drop-down menu is disabled again, because you can define the appropriate frame rate in one of the earlier dialogs.

Pixel aspect ratio allows you to choose one of the predefined parameters here. When you select **Custom** here, you have the opportunity to specify a free value using the corresponding spinboxes that are now available.

The drop-down menu **Picture Structure** enables you to define whether transcoder should work in Frame coding (**Progressive**) or Field coding (**Interlaced**) mode. In **Interlaced** mode, the video footage is encoded field-based, i.e. the whole picture is saved, but no fields or field information will be used. In Progressive mode the video is encoded frame-based, i.e. frames will be saved which include field information. These will be used to combine the

individual fields to one frame. Using this method the temporal aspect of the fields is considered, i.e. whether the top field or the bottom field is saved first. The third option is **MBAFF**. MBAFF is the acronym for *MacroBlock Adaptive Frame/Field* coding. Using this option, the encoder in each case writes two fields as one frame in the stream, i.e. it uses interlaced frame coding.

Field Order specifies the field order of the video. The available options are **Top Field First**, and **Bottom Field First**.

The parameters under **Pulldown** convert 23.976 fps (frames per second) to 29.97 fps, or 24 fps to 30 fps, and it is supposed to be done only on progressive frame video (like film). The movie studios slow their films from 24 fps to 23.987 and then encode using pulldown to display at 29.97 fps. The video encoder manipulates the *Top Field First* (tff) and *Repeat First Field* (rff) flags to convert 4 frames (8 fields) to 5 frames (10 fields) like this:

(T = top field, B = bottom field)

frame 1: tff = 1, rff = 0 fields displayed: TB
frame 2: tff = 1, rff = 1 fields displayed: TBT
frame 3: tff = 0, rff = 0 fields displayed: BT
frame 4: tff = 0, rff = 1 fields displayed: BTB

So you get the sequence of fields: TB TBT BT BTB or grouped as frames: TB TB TB TB TB. The above would be considered **2:3** pulldown as it is 2 fields, 3 fields, 2 fields etc.

3:2 is the reverse:

frame 1: tff = 1, rff = 1 fields displayed: TBT
frame 2: tff = 0, rff = 0 fields displayed: BT
frame 3: tff = 0, rff = 1 fields displayed: BTB
frame 4: tff = 1, rff = 0 fields displayed: TB

In this case you get the sequence of fields: TBT BT BTB TB or grouped as frames: TB TB TB TB TB.

In most cases the H.264/AVC Encoder adjusts the necessary settings automatically, so that the **Pulldown** option remains disabled.

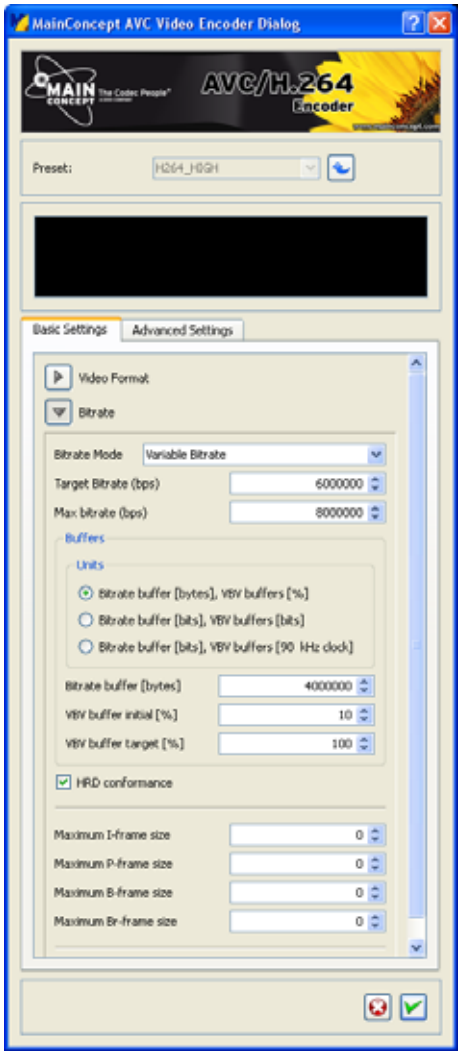
The drop-down menu **Chroma Format** allows you to specify the chrominance sampling. Available parameters are **4:0:0, 4:2:0, 4:2:2** and **4:4:4**. The latter is currently not supported.

Bit-depth Luma specifies the bit depth of the encoded luminance samples. Available values are **8 bits** and **10 bits**. The **10 bits** value is only available for High 10 profile and higher.

Bit-depth Chroma specifies the bit depth of the encoded chrominance samples. Available values are **8 bits** and **10 bits**. The **10 bits** value is only available for High 10 profile and higher.

In the black field of the dialog, the encoder shows possible errors which might be caused by wrong settings, because some parameters are not allowed in a specific combination.

The **Bitrate** area offers the following options:



The drop-down menu **Bitrate Mode** offers four options: **Constant Bitrate** offers a fixed bitrate (the relevant input prompt will be enabled if selected). Choosing **Variable Bitrate** option defines the maximum value of the bitrate range the encoder should stay within while encoding. The average value is the desired average bitrate of the video stream. The relevant input prompts will be enabled if selected. **Const. Quality - Constant Quantization** is the third option. It offers quantization parameters for the different slice types (I, P and B). Using this function, the bitrate can vary without any limitation in contrast to VBR and CBR mode. A lower value for any slice quantization parameter will result in better quality. The value range is between 1 and 52. The last option is **Const. Quality - Average Quantization**. It is similar to the previous option, but the encoder will use an average quantizer instead of a constant one.

Under **Target Bitrate (bps)** you define a fixed average bitrate for the encoding process (in bits per second). The **Main** profile offers a higher quality here. It is only available for **Variable Bitrate**.

The **Max Bitrate (bps)** input prompt is only available in VBR mode (in bits per second). Here you specify the maximum bitrate for the encoder, it should not exceed.

Under **Buffers** you have different options on how to specify the corresponding values:

Under **Units** you see three checkboxes that specify how the different buffer values should be calculated and displayed. Depending on the option they can be set in bytes, percent, bits, etc.

Bitrate buffer specifies the size of the virtual buffer verifier in bytes or bits. This value should be adjusted to bitrate (Constant Bitrate) or to maximum bitrate (Variable Bitrate), to avoid DTS/PTS underflows during muxing.

VBV buffer initial specifies the initial state of the HRD buffer in percent, bits or 90 kHz clock.

VBV buffer target specifies the target state of the HRD buffer in percent, bits or 90 kHz clock.

The checkbox **HRD conformance** controls applying HRD conformance in the encoder. In most cases it is recommended to disable this parameter whenever possible. However, some video formats may require HRD conformance, such as Blu-ray, Sony PSP, Apple iPod, etc. For general or custom presets, it is always disabled.

Depending on the **Bitrate Mode**, the following settings can differ:

Maximum I-frame size defines a value which limits the maximum number of frame bits for each I-frame.

Maximum P-frame size defines a value which limits the maximum number of frame bits for each P-frame.

Maximum B-frame size defines a value which limits the maximum number of frame bits for each B-frame.

Maximum Br-frame size defines a value which limits the maximum number of frame bits for each B-frame used as reference.

Quantizer I-frames specifies the macroblock quantization value for I-slices, that are used in constant quality/quantization mode. The value range is 0 - 51.

Quantizer P-frames specifies the macroblock quantization value for P-slices, that are used in constant quality/quantization mode. The value range is 0 - 51.

Quantizer B-frames specifies the macroblock quantization value for B-slices, that are used in constant quality/quantization mode. The value range is 0 - 51.

Maximum Quantizer defines the maximum quantization parameter that should be used. The value range is 0 - 51.

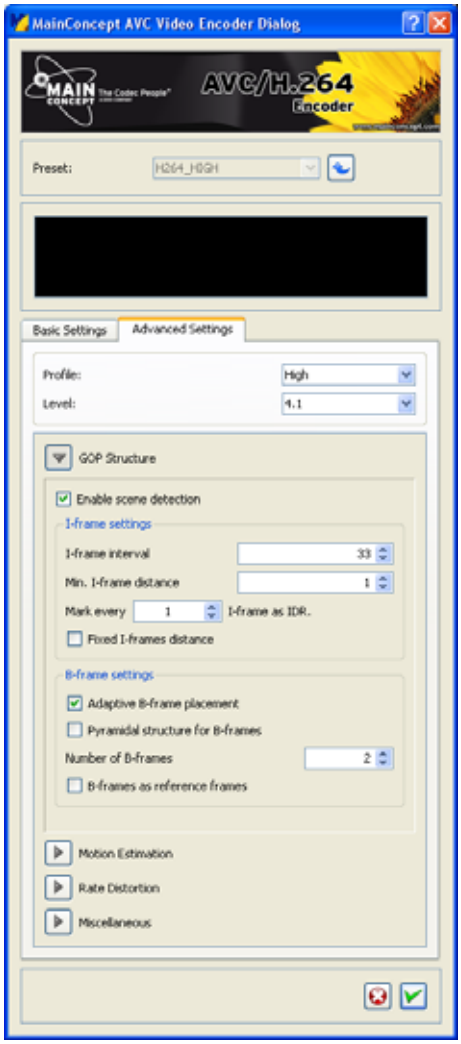
Mainimum Quantizer defines the minimum quantization parameter that should be used. The value range is 0 - 51.

The Advanced Settings Pane

The **Advanced Settings** pane offers settings for adjusting the **Profile** and **Level**. Moreover, you find several options for the **GOP Structure**, **Motion Estimation, Rate Distortion** and a section for **Miscellaneous** options here.

The drop-down menu **Profile** enables you to change the H.264 profile if necessary. The available options are **Baseline**, **Main** and **High**.

The parameters under **Level** define the limits for the settings. A higher level results in more available settings. The H.264 spec (specification) allows for a large number of variations in the settings, e.g. the frame resolution can theoretically be as large as 2^{14} x 2^{14}. The **Profile** and **Level** just set limits on what the values of some of the other settings can be.



Under **GOP Structure** you find several checkboxes:

Ticking the checkbox **Enable scene detection** activates the visual content scene detection (vcsd) that can be used for getting better quality on scene changes.

The **I-frame settings** sections offers several options:

I-frame interval specifies the number of frames between I-frames or the number of frames in a GOP. If this value is 1 only I-frames are generated.

Min. I-frame distance specifies the minimum GOP length, i.e. the difference to the previous I-frame.

Mark every n-th I-frame as IDR allows you to mark every n-th I-picture as IDR.

The **Fixed I-frame distance** means that there is always an I-frame at the multiple of a GOP length. So e.g. when the GOP length is 30, you can set an I-frame at a scene cut this way.

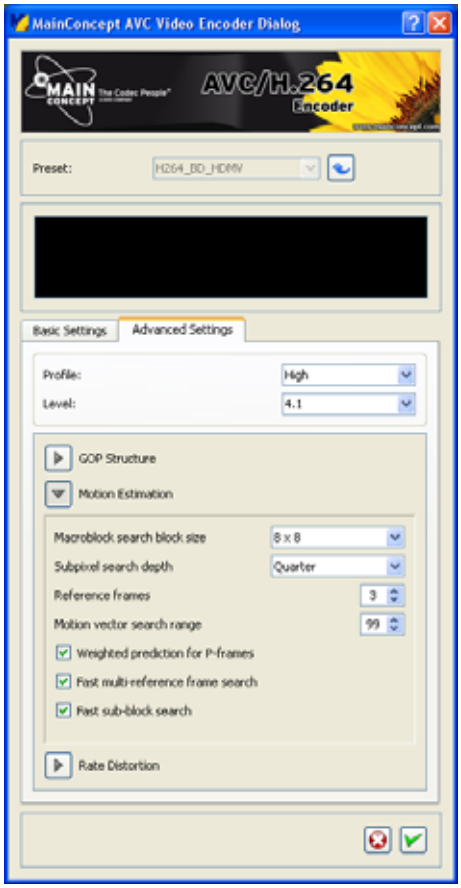
The **B-frame settings** sections offers several options:

Allow adaptive B-frame placement allows the user to specify even B-slices as reference.

Allow pyramidal structure for B-frames allows the usage of pyramid B-pictures coding. For example when encoding 3 B-frames, such as IbBbP, B will be encoded before b, and B will be used as reference for both b pictures.

Number of B-frames specifies the number of B-frames between consecutive I- and P-frames.

When the **B-frames as reference frames** checkbox is enabled you can specify in what intervals a reference frame appears (P-frames). Under Baseline there are no B-frames.



Under **Motion Estimation** you find the following options:

Under **Macroblock search block size** you specify the search mode for the macroblocks. In these areas the encoder predicts inter-coded macroblocks in P-slices. The inter-prediction creates a prediction model from previously encoded frames. It can be combination of the following flags: 8x8 and 16x16.

The drop-down menu **Subpixel search depth** enables you to choose the subpixel motion search depth. **Full** means that only the full pixel position will be examined. When choosing **Half**, only half-pixels positions will be added to the search. **Quarter** means that both half and quarter pixel positions will be added.

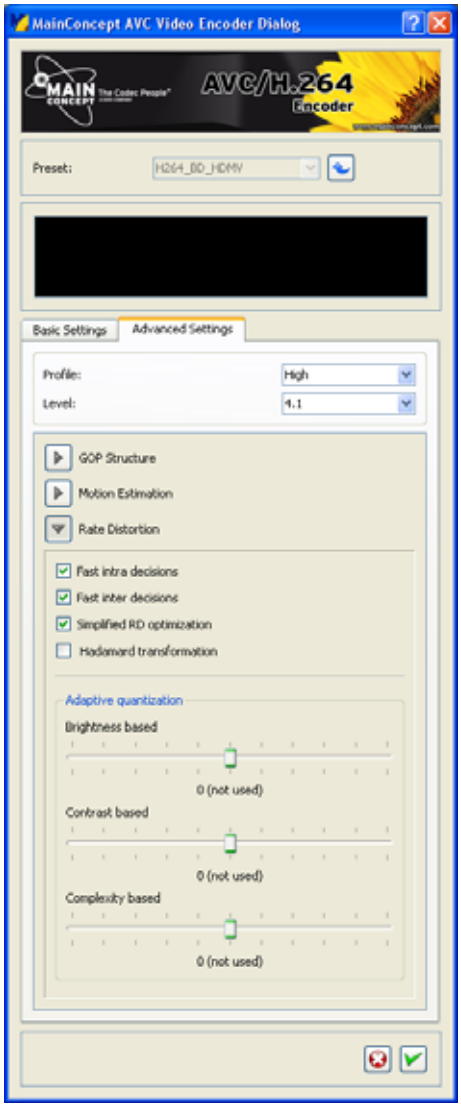
Using the spinbox **Reference Frames** you specify the maximum number of reference frames you want to search for, in order to encode a picture. The value range is 1 .. 128.

Motion vector search range specifies the motion vector range from a spatial point of view.

Weighted Prediction for P-frames can be used supplementary to motion compensation and reference picture selection for prediction of the current picture content. When Weighted Prediction in P-slices is utilized, customized weights can be applied as scaling and offset to the motion-compensated prediction parameter before its usage as a predictor for the current picture samples. It can be very useful for fading scenes. You can enable the option with **On** or turn it off by setting it to **Off**.

Enable **Fast multi-reference frame search** offers a heuristic search mode which is significantly quicker, but can result in a loss of quality. Disabling the checkbox offers a greedy search mode. It is slower, but can result in better quality.

Enable **Fast sub-block search** offers a heuristic search mode which is significantly quicker, but can result in a loss of quality. If it is disabled a greedy search mode is used. It is slower, but can result in better quality.



Under **Rate Distortion** you find the following options:

The checkbox **Fast Intra Decisions** allows the encoder to use fast intra coding decision metrics, in order to speed up the encoding process. This option can slightly decrease picture quality, but will result in a significant speed improvement.

The checkbox **Fast Inter Decisions** allows encoder to use fast inter coding decision metrics, in order to speed up the encoding process. This result can be a decrease in picture quality, but at the same time it leads to some speed improvement.

The **Simplified RD Optimization** checkbox allows you to enable the optimization for rate distortion. The rate distortion specifies the trade-off between quality and bitrate. If the checkbox is enabled is a heuristic rate distortion optimization mode is used which is significantly quicker, but can result in a loss of quality. If it is disabled a greedy optimization mode is used. It is slower, but can result in better quality.

The **Hadamard transformation** option enables and disables the *Hadamard Transformation*. This is an optimized cosine transformation. Activating the option, the clip will be encoded in better quality, and it will have a smaller file size.

Under **Adaptive quantization** you find several sliders:

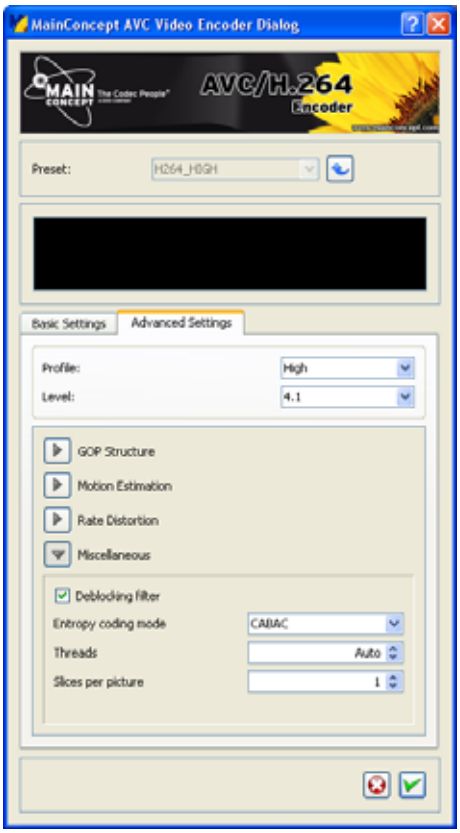
When using **Brightness based** macroblock-adaptive quantization the macroblock quantization scale depends on the average brightness level. **0** means that the option is not used. Positive values denote coarser quantization for macroblocks with brightness higher than the average value for the current picture.

When using **Contrast based** macroblock-adaptive quantization the macroblock quantization scale depends on the contrast level. **0** means that the option is not used. Positive values denote coarser quantization for macroblocks with contrast higher than the average value for the current picture.

When using **Complexity based** macroblock-adaptive quantization the macroblock quantization scale depends on the complexity level. **0** means that the option is not used. Pos-

itive values denote coarser quantization for macroblocks with complexity higher than the average value for the current picture.

Under **Miscellaneous** you find the following options:



The **Deblocking Filter** option enables you turn on and off the deblocking filter for smoothing video frames. Ticking the option enables the deblocking filter.

Entropy coding mode allows you specify this mode. The **CABAC** option is only available for the Main and High profile. CABAC is the abbreviation of *Context-Based Adaptive Binary Arithmetic Coding*. Using this option only binary decisions are encoded. A non-binary item is “binarized“ or converted into binary code. When CABAC is disabled the encoder automatically switches to **CAVLC** (*Context-Adaptive Variable Length Coding*). In general, we recommend to use the CABAC option, if it is available. Although it is slower, it offers a higher compression and much better quality than CAVLC.

Threads specifies the number of threads to be used during encoding. **Auto** mode will automatically find the optimum number of threads, 1 means single threaded encoding, more threads will use more CPUs/cores.

Slices per picture specifies the number of slices that should be used per picture.

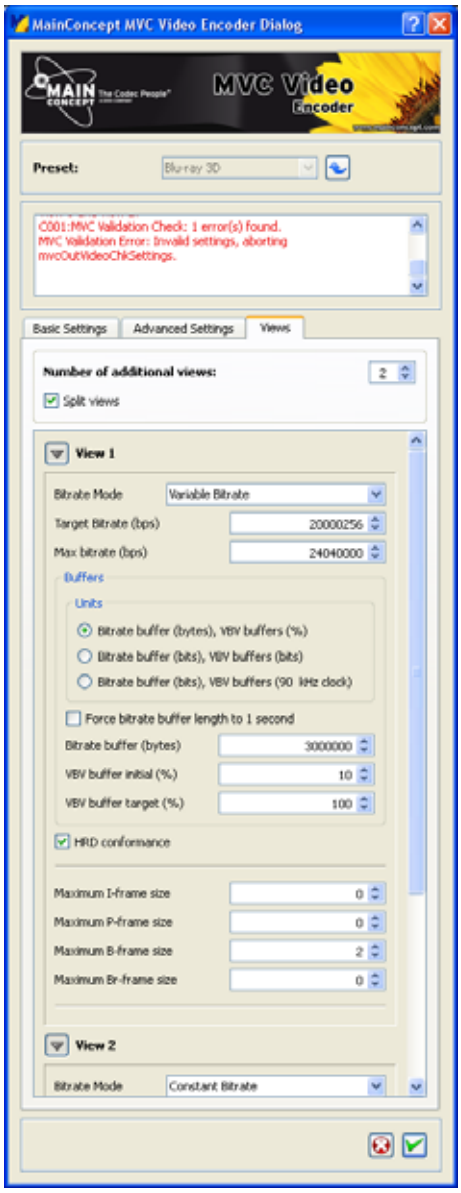
The Views Pane

The **Views** pane offers some specific MVC settings that define the number as well as the parameters of the individual views.

Number of additional views specifies the total number of views. The current Reference MVC Beta version supports three views only.

Split views enables you to create two streams, i.e. one for each view (left and right). If the checkbox is disabled, Reference MVC generates one stream only that includes both base and dependent view.

The **View** options enable you to define the values for each view in the stream, e.g. for Blu-ray 3D this would be the *Base and Dependent View*. Depending on the **Number of additional views**, the same amount of fields are enabled.



The drop-down menu **Bitrate Mode** offers four options: **Constant Bitrate** offers a fixed bitrate (the relevant input prompt will be enabled if selected). Choosing **Variable Bitrate** option defines the maximum value of the bitrate range the encoder should stay within while encoding. The average value is the desired average bitrate of the video stream. The relevant input prompts will be enabled if selected. **Const. Quality - Constant Quantization** is the third option. It offers quantization parameters for the different slice types (I, P and B). Using this function, the bitrate can vary without any limitation in contrast to VBR and CBR mode. A lower value for any slice quantization parameter will result in better quality. The value range is between 1 and 52. The last option is **Const. Quality - Average Quantization**. It is similar to the previous option, but the encoder will use an average quantizer instead of a constant one.

Under **Target Bitrate (bps)** you define a fixed average bitrate for the encoding process (in bits per second). The **Main** profile offers a higher quality here. It is only available for **Variable Bitrate**.

The **Max Bitrate (bps)** input prompt is only available in VBR mode (in bits per second). Here you specify the maximum bitrate for the encoder, it should not exceed.

Under **Buffers** you have different options on how to specify the corresponding values:

Under **Units** you see three checkboxes that specify how the different buffer values should be calculated and displayed. Depending on the option they can be set in bytes, percent, bits, etc.

Bitrate buffer specifies the size of the virtual buffer verifier in bytes or bits. This value should be adjusted to bitrate (Constant Bitrate) or to maximum bitrate (Variable Bitrate), to avoid DTS/PTS underflows during muxing.

VBV buffer initial specifies the initial state of the HRD buffer in percent, bits or 90 kHz clock.

VBV buffer target specifies the target state of the HRD buffer in percent, bits or 90 kHz clock.

The checkbox **HRD conformance** controls applying HRD conformance in the encoder. In most cases it is recommended to disable this parameter whenever possible. However, some video formats may require HRD conformance, such as Blu-ray, Sony PSP, Apple iPod, etc. For general or custom presets, it is always disabled.

Depending on the **Bitrate Mode**, the following settings can differ:

Maximum I-frame size defines a value which limits the maximum number of frame bits for each I-frame.

Maximum P-frame size defines a value which limits the maximum number of frame bits for each P-frame.

Maximum B-frame size defines a value which limits the maximum number of frame bits for each B-frame.

Maximum Br-frame size defines a value which limits the maximum number of frame bits for each B-frame used as reference.

Quantizer I-frames specifies the macroblock quantization value for I-slices, that are used in constant quality/quantization mode. The value range is 0 - 51.

Quantizer P-frames specifies the macroblock quantization value for P-slices, that are used in constant quality/quantization mode. The value range is 0 - 51.

Quantizer B-frames specifies the macroblock quantization value for B-slices, that are used in constant quality/quantization mode. The value range is 0 - 51.

Maximum Quantizer defines the maximum quantization parameter that should be used. The value range is 0 - 51.

Mainimum Quantizer defines the minimum quantization parameter that should be used. The value range is 0 - 51.

Depending on the **Number of additional views**, the options described above can be adjusted for the next **View**.

Technical Support

MainConcept Support

If you want more information about MainConcept Reference MVC, visit our website at www.mainconcept.com. Visit the **Support** section for a variety of resources.

If you need additional assistance, the MainConcept Technical Support team is standing by to help. Send an e-mail to support@mainconcept.com, and we'll assist you as quickly as possible.

Additional Information

Be sure to check the MainConcept website frequently for updated tips, tricks, tutorials and other information on Blu-ray 3D and MVC encoding.

Thank you for choosing MainConcept Reference!